

# Seminář odd. 26

## Tenkých vrstev a nanostruktur

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### TÉMA

## Synthesis and applications of detonation nanodiamonds

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The NS3E laboratory synthesizes detonation nanodiamonds by detonation of explosives since many years. These very small nanoparticles (i.e. 5 nm) can be used for a wide variety of applications in many fields such as sensing, medicine, pyrotechnics, optics.

We developed a novel approach to synthesize detonation nanodiamonds by using nanostructured explosives. Using this kind of explosive has never been experimented elsewhere in the world as we are the only one laboratory to be able to produce enough quantities to achieve explosive charges. This new synthesis method leads to novel results in the control of the size and the properties of the synthesized nanodiamonds, but also in the understanding of the nanodiamond synthesis and the detonation mechanisms [1, 2].

The modification of the composition or the structure of the explosive charge is an important point to synthesize different kind of nanodiamonds. Due to the know-how of our institute it is possible to change the geometry and the formulation of the explosive composition. For instance, by adding melamine to the explosive, the nitrogen content in the core of the detonation nanodiamond particles was significantly increased [3].

Studies on the nanodiamond chemistry have been achieved to obtain a functional material. Analysis of the surface chemistry of the nanodiamonds was undertaken by different techniques [4], the nanodiamonds have been functionalized by molecules such as porphyrins and deposits of detonation nanodiamonds monolayers were successfully obtained by the combination of ultracentrifugation and electrophoresis deposition. These deposits allowed imaging the surface of the single particles by Scanning Probe Microscopy techniques and measuring their band gap [5]. Some of these results will be presented.

The optical properties of the nanodiamonds are particularly interesting due to the multiple photon absorption processes occurring when illuminated by different wavelengths [6]. First results of the nonlinear response of detonation nanodiamonds depending on their size will be discussed [7].

#### References

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